IES

Newsletter

Volume 19, Number 5
September - October 2002

Director's Note

This issue is the first from the desk of Lori Quillen, the Institute's new Public Information Specialist. As editor, Lori will both shape the IES Newsletter and write specific articles in it. Her lifelong interests, education, and former assignment as Outreach Coordinator/Educator for the Nature Conservancy, equip her admirably to bring our science to a growing audience.

The natural world has always offered fascinating surprises and, increasingly, evidence of changes accelerated by human activity. The conversation with Forest Ecologist Dr. Charles Canham describes changes to the forests around us. The student detectives tracing the origin of a disease found in local foxhounds illustrates a characteristic of ecological research: often things are present but we don't know it until someone with the motivation and skill starts to look. There is no doubt that sand flies exist in habitats similar to ours elsewhere in Dutchess County. Dr. Ostfeld's students were simply the first to look carefully.

The *IES Newsletter* is published by the Institute of Ecosystem Studies, located at the Mary Flagler Cary Arboretum in Millbrook, New York.

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Printing: Central Press, Millbrook, N.Y.

Student Research Unraveling Local Disease Mystery

Two years ago, foxhounds at a local kennel began wasting away from a mysterious malady. Affected animals were lethargic and exhibited enlarged joints, skin lesions, sub-dermal skin growths, facial hair loss, and weight loss. Initially, veterinarians suspected that a tick-borne disease had infected the dogs. In the spring of 2001, an autopsy performed at North Carolina State University led to the discovery of the parasite *Leishmania* in one of the dogs. Researchers at the Centers for Disease Control and the NYS Department of Health were shocked to discover that over 40% of the kennel's foxhounds were afflicted with the tropical disease, visceral leishmaniasis.

Commonly found in warm tropical climates, leishmaniasis is a parasitic protozoa infection that is transmitted by the bite of an infected female sand fly. Sand flies are small blood-feeding insects that breed in forests, caves, and rodent burrows. They become infected with the leishmaniasis protozoa when they take a blood meal from an infected reservoir host. The most common reservoirs for the strain of leishmaniasis found in the foxhounds are domestic dogs, coyotes, foxes, and rats. In Europe people have been infected by leishmaniasis from dogs, a situation that has not happened here in the US.

Leishmaniasis can manifest itself as a cutaneous disease, causing ulcers and lesions, or as a more deadly visceral disease that results in anemia, fever, and enlargement of the liver and spleen. Visceral leishmaniasis infects 500,000 humans annually, with 90% of the cases occurring in Brazil, India, Sudan, and Bangladesh. The geographic distribution of the disease is limited by the distribution of the sand fly, which is limited by cold climates. People with compromised immunity are most prone to infection and there is no vaccination. If left untreated visceral leishmaniasis has a near 90% mortality rate.

The public health community responded to the local occurrence by testing foxhounds nation-wide for leishmaniasis, ceasing the movement of infected animals, and monitoring the kennel property for the presence of sand flies. To date, sand flies have not been found on the grounds of the kennel. There are only three species of sand flies in North America that have been incriminated as vectors for leishmaniasis, and at the time of the foxhound infections there were no known records of sand flies in Millbrook. They prefer warmer climates and some researchers believed the area was outside of the species' geographic range.

Lori Quillen

REU student Pamela Roy sorting sand flies

The Institute – with its unique combination of scientific expertise, 778 hectares of land (1,924 acres), and student research opportunities – provided an ideal setting for surveying sand fly populations. Under the leadership of Dr. Richard Ostfeld, an expert in vector-borne diseases and pioneer in the emerging discipline of conservation medicine, two student interns successfully trapped and identified the sand fly *Lutzomyia vexator* on Institute grounds in 2001. Harvard University medical student Lauren Canter and Tufts University veterinary student Wendy Haumaier found that sand fly populations had a wide distribution on the property, with a seasonal peak in late July.

The discovery of a local sand fly vector, in conjunction with the presence of the infected foxhounds, raised a number of human health questions. Describing the life history of *Lutzomyia vexator* populations is fundamental to understanding the potential for leishmaniasis risk to humans and other mammals.

During the summer of 2002, Pamela Roy, a biology student at Bard College, began a Research Experiences for Undergraduates (REU) project to further investigate sand fly populations on the Institute's grounds. Funded by the National Science Foundation and the Andrew W. Mellon Foundation, REU students spend 12 weeks at the Institute conducting ecological research projects and collaborating with the IES community. Under the guidance of Dr. Richard Ostfeld and Dr. Felicia Keesing, of

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Forest Health: A Discussion with Dr. Charles Canham

Last month, the New York Times ran several articles about the spread of "sudden oak death," a disease caused by a fungus-like micro-organism *Phytophthora ramorum*. Discovered in California in 1995, it has now reached epidemic proportions in forests on the state's central coast, leaving thousands of dying trees in its wake. Despite its name, sudden oak death is known to impact over 14 tree species, including Douglas fir, live oak, tan oak, and California's prized redwoods. Non-native to the US, and closely related to the pathogen that caused Ireland's potato blight, *P. ramorum* has already wiped out vast tracks of forests in western Australia. No cure is known.

I talked recently with IES Forest Ecologist Dr. Charles Canham about forest diseases. The northeastern US is no stranger to pests and pathogens that compromise tree health, and in his years studying forest dynamics Dr. Canham has encountered gypsy moth defoliations, hemlock wooly adelgids, and beech bark disease die-offs in the Adirondacks. Here are some excerpts from our conversation.

What are your thoughts on sudden oak death?

It is too early to tell what is happening to the impacted ecosystems. We do not know answers to important questions: what are the rates of mortality, what percentage of the population is it going to affect, and will it only affect some portion of the population that is already stressed? I think we need to understand what the consequences of the introduction of this pest or pathogen will be. This will help us determine the severity of the situation and, as a society, how much should we be willing to spend to take care of it.

In 1981, before I arrived at IES, there had been a huge defoliation. Gypsy moths had eaten virtually every leaf down to the ground in every forest between Ithaca, NY and RI. By June there was essentially no foliage on any of the trees, even the conifers. There were no environmental stresses that year, such as drought or exceptionally poor air quality, and that severe defoliation killed very few trees on its own. During the 80's, on the other hand, when small periodic gypsy moth outbreaks occurred in conjunction with other stresses, such as drought, tree deaths did occur. There are still areas in the region where you can see the hulks of big oaks that died because of the combination. Pests and pathogens often only have a severe impact when they act in concert with other stresses. That relationship is difficult to study. You may not see anything until the chance dry year, and then you have a dieback. If we do not put these things in an ecological context– we miss a big part of the story.

What are some of the forest health issues facing NY and New England?

Hemlock wooly adelgid, an aphid-like sap sucking insect that feeds on young branches, is a current problem. The prognosis is grim; insects move slowly and take a number of years to kill hemlocks, but there is nothing that will stop them from spreading. There was an effort to release a biological control agent, and initially the Institute debated about volunteering to be a test site. We decided, in

Pavel Svihra

Leaf spots on rhododendron caused by Phytopthora

the absence of sound research on possible side-effects and the history of ineffective biological control agents, to forgo the project. There is a clear chance that a very large proportion of our hemlocks will die.

Beech bark disease, caused by a combination of beech scale insect feeding and fungi infection, is another issue. IES Ph.D. student Erika Latty's thesis work shows that there is genetic variation in resistance to the disease that is tied to the content of amino acids in the bark of beech trees. Trees that have bark with a low nitrogen content and fewer amino acids are less nutritious to the feeding insects. Insects don't develop as well on these trees, resulting in fewer insects and fewer pits for the fungus to infect.

Erika showed that in old growth forests the bark nitrogen content of all trees is elevated. Air pollution from this is swamping out the genetic variation in resistance to the disease. In the absence of nitrogen deposition through acid rain we would expect to have some big healthy trees, but we are seeing fewer and fewer. Unfortunately, beech reproduces vegetatively so you do not expect much evolution of resistance. A disease that kills adults but leaves young alive doesn't eliminate the susceptible genotypes.

What was your earliest encounter with a tree disease here at IES?

When I arrived at the Arboretum in 1984, we were at the tail-end of a mysterious disease outbreak that killed the majority of dogwoods in the forest. The causal agent was a fungus in the anthracnose family that caused lower-branch dieback syndrome. During the first vegetation survey of the woods, the dead and dying dogwoods were still standing. Some of the trees survived in the sunny dry environments of open fields, but we lost 95% of flowering dogwoods from the forest understory, where they had been one of the most abundant tree species.

How often are these diseases emerging in eastern forests?

New problems are emerging far more frequently than prior to European settlement, and it is pretty clear in almost all these cases that humans are introducing the organisms. Introduced pests and pathogens are responsible for the biggest changes in our forests.

How do these impacts compare to other factors changing forests?

Logging arguably alters the landscape and clearing reduces forests, but logging by itself is not the kind of functional change to an ecosystem that removal of a species is. You log, you get succession, you get back the forest. It may differ from what was there before, since logging has a variety of impacts depending on how it is done, but it is a far more qualitative change to take out what was once a dominant species and eliminate it as a common member of the canopy. Introduced pests and pathogens have had that effect on some of the major species.

What does the future look like?

If we lose hemlock on top of beech, we have taken two of the four remaining major species of northern hardwoods out of New England forests. Sugar maple, beech, red spruce, and hemlock are the late succession shade tolerant dominants. And two of those will no longer be canopy trees in the foreseeable future, so that is a big change. Beech is a classic large-fruited tree whose seeds are a major food resource for lots of organisms and hemlock has very distinct effects on the forest understory, such as deep shade and a rich litter layer. These are pretty big changes and not ones that we've had any record of success in stopping.

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Lori Gavlen

IES Director Dr. Gene E. Likens recently hosted the American Institute of Biological Sciences Executive Retreat. AIBS is a non-profit scientific organization that advances research and education in the biological sciences. Dr. Likens is currently serving as the President of the AIBS Board of Directors. ***L-R: Dr. Dan Johnson, Dr. Richard O'Grady, Mr. Richard Burk, Mr. Brett Burk, Dr. Judith Weis, Dr. Jane Brockmann, Dr. Gary Hartshorn, Dr. Gene E. Likens.***

Forest Health, *from page 2*

To best address this issue we need more collaborations between ecologists and plant pathologists, and more plant pathologists trained in working with native species. Presently, it will be interesting to see if ecologists can come up with anything other than a diagnosis of the damage that will be done, and whether we will be able to come up with any success stories. In Europe, there is some clever research with chestnut blight. They have found a non-lethal strain of the fungus and released it in the wild, where it out competes the virulent strain. By addressing the disease as a competition between organisms, they are getting healthy chestnuts again. Our only hope in dealing with forest diseases is to have ways of assessing the consequences of an outbreak and applying clever collaborative science. ●

IES Departing Post-Docs

Post-doctoral positions at IES allow scientists that have recently completed their PhD's the ability to engage in professional research. In 2002, a number of IES post-docs completed their stay and moved on to a range of challenging academic and applied ecological positions. **Eric M. Schauber** is employed as an Assistant Professor at Southern Illinois University, with a joint appointment in the Department of Zoology and the Cooperative Wildlife Research Laboratory. **Rodney T. Venterea** is serving as both a Research Soil Scientist with the US Department of Agriculture's Agricultural Research Service (ARS) and as an Adjunct Assistant Professor with the Department of Soil, Water, and Climate at the University of Minnesota in St. Paul. **Seth W. Bigelow** is taking a position at the Sierra Nevada Research Center of the US Forest Service as a Post-Doctoral Research Scientist. He will be focusing on stand and landscape-level effects of Ponderosa pine forest restoration in Lassen and Plumas National Forests. **Kathleen LoGiudice** has accepted an appointment as an Assistant Professor in the Department of Biological Sciences at Union College in Schenectady, NY. **Ross D. Fitzhugh** is currently an Assistant Professor in the Department of Plant Biology at the University of Illinois at Urbana-Champaign. He will be continuing his research in the Catskills with Gary M. Lovett and Kathleen C. Weathers, as well as at Hubbard Brook with Peter M. Groffman and Gene E. Likens. **Roxanne Maranger** has taken a break for motherhood, but continues to collaborate with Michael L. Pace and Charles D. Canham.

Sand Flies, *from page 1*

Bard College, Ms. Roy developed a study that built on the *Lutzomyia vexator* data collected by Canter and Haumaier. Roy's project set out to gather an ecological profile for the species and compare her data with the data collected in 2001.

The timeliness of her project gave Roy the opportunity to gain scientific insight into a topic with significant ecological and human health ramifications. From late June to early August she monitored 6 light traps baited with carbon dioxide, which attract flies seeking an animal host. The traps use a fan to suck insects into a cloth funnel, allowing later lab analysis. Moths and mosquitoes were the most abundant catch, and Roy had to sort through piles of them to find sand flies. Traps were set near data loggers, which measure forest temperature and humidity, and help determine the conditions preferred by the flies. The capture techniques were similar to those used by Canter and Haumeier, but Roy studied a larger number of sites for a longer time and measured microclimatic conditions.

Her results supported the earlier findings; there is a widespread population of the sand fly *Lutzomyia vexator* on the Institute's grounds, with populations peaking in late July. More research is needed to determine if these sand flies are competent leishmaniasis vectors. To be a successful vector, they need to take at least two blood meals, one to acquire the parasite from a reservoir host and another to transmit it to a victim. Colder northern climates may shorten the insect's lifespan, decreasing its efficiency as a vector. Roy plans to collaborate with researchers at Cornell University to determine what animal species the sand flies caught at the Institute were feeding on.

Infected foxhounds from the kennel travel extensively during the hunt season. Initially, federal agencies investigating the incident did not suspect a local vector was present, and concluded that the dogs were infected while mixing with foxhounds in the southern US. There is no way to determine how the animals contracted leishmaniasis, but we now know that the vector species *Lutzomyia vexator* is in fact present locally.

Currently, leishmaniasis is not a local human health threat. None of the workers at the kennel was infected with the disease, and there have been no documented incidents of human leishmaniasis in the state.

After completing her coursework at Bard College, REU student Pamela Roy has a strong interest in pursuing an advanced degree in epidemiological studies. The research she conducted at IES has reinforced her desire to continue scholarship in disease migrations. ●

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US Postage
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Millbrook, NY
Permit No. 16

Newsletter

Volume 19, Number 5
September - October 2002

Printed on
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Calendar

CONTINUING EDUCATION

For information, or to request a catalog, call the Continuing Education office at 845-677-9643 or visit www.ecostudies.org/education/continuing.html. Fall semester programs include:

Gardening

October 19(1 Sat.): **Cold Frame Rewards**
November 2(1 Sat.): **Designing with Native Perennials**
November 3(1 Sun.): **Conifers in the Landscape**

Natural Science Illustration

October 17(4 Thurs.): **Focus on Leaves II**
October 20(6 Sun.): **Art Forms in Nature II**

Workshop

October 26(1 Sat.): **Pond Enhancement, Restoration, and Management**

SATURDAY ECOLOGY PROGRAMS

Come to **free public programs.** Children age 6 and up are welcome with an accompanying adult. Pre-registration isn't necessary. If you have questions, call 845-677-7600 ext. 317 for information on upcoming programs: Programs are from 1 - 3 p.m. and begin at the Gifford House Visitor and Education Center. [Dress according to the weather for the outdoor programs.]

ECOLOGY FIELD PROGRAMS FOR CHILDREN

Teachers – sign up for our Plant Power program in the tropical greenhouse during January or February. It's a great way to study plant ecology on cold winter days. To register call 845-677-7600 ext. 316 or email Eberths@ecostudies.org.

THE ECOLOGY SHOP

New items in the shop. One-of-a-kind jewelry by local craftsperson Barbara Willmer, pewter animal figures, a large selection of Peterson's field guides, and many new toys and books for children. Come in and browse!
Senior Citizens Days: 10% off on Wednesdays.

IES SEMINARS

Free scientifc seminars are held at 11 a.m. on Fridays in the auditorium from September until early May.
Oct. 11: **To grow or not to grow in shade: A question of survival...and death for trees!** Dr. Christian Messier, Groupe de Recherche en Ecologie Forestiere interuniversitaire (GREFi).
Oct. 18: **Human alteration of the global nitrogen cycle.** Dr. James Galloway, Marine Biological Laboratory.
Oct. 25: **Food webs in space: Reflections on the interplay of dynamic instability and spatial processes.** Dr. Robert Holt, University of Florida
Nov. 1: **Of sea salts, salmon, and saturation: Watershed biogeochemistry in the Oregon Coast Range.** Dr. Jana Compton, US Environmental Protection Agency.
Nov. 8: **Complex interactions between topdown and bottom-up forces and the control of phytophagous insect populations.** Dr. Robert Denno, University of Maryland.
Nov. 15: **Nutrient processing in streams of the Hubbard Brook Experimental Forest.** Dr. Emily Bernhardt, Nicholas School of the Environment and Earth Sciences.
Nov. 22: **Smog - not only in the cities.** Dr. F. Sherwood Rowland, University of California.
Dec. 6: **Neighborhood dynamics in a tropical forest. Dr. Maria Uriarte,** Insitute of Ecosystem Studies.

HOURS

Winter Hours: October 1 - March 30
Internal roadways and trails closed during deer hunting season, and when snow covered.

Public attractions: Mon.-Sat., 9-4, Sun. 1-4; closed public holidays. The greenhouse closes at 3:30 daily.
The Ecology Shop: Mon.-Fri., 11-4, Sat. 9-4, Sun. 1-4. *(Please note: The shop is closed Mon.-Sat. from 1-1:30.)*
Free permits are required and are available at the Gifford House Visitor and Education Center until one hour before closing time.

GREENHOUSE

The Greenhouse is a year-round tropical plant paradise and a site for controlled environmental research. The green house is open daily until 3:30 p.m. with a free permit (see HOURS).

MEMBERSHIP

Join the Institute of Ecosystem Studies. Benefits include subscription to the IES Newsletter, member's rate for courses and excursions, a 10% discount on IES Ecology Shop purchases, and participation in a reciprocal admissions program. Individual membership: $40; family membership: $50. Call the Development Office at 845-677-7600 ext. 120.

The Institute's Aldo Leopold Society
In addition to receiving the benefits listed above, members of The Aldo Leopold Society are invited guests at spring and fall IES science updates. Call the Development Office at 845-677-7600 ext. 120.

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For garden tips, visit: www.ecostudies.org/welcome/gardens.html.